TEN YEARS OF HYDROGRAPHIC VARIABILITY OFF THE CENTRAL CALIFORNIA COAST DURING THE UPWELLING SEASON

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Analysis of mean conditions and variability during the upwelling season off central California was performed on data sets of buoy and shoreline surface measurements and conductivity, temperature, and depth (CTD) data from ten annual National Marine Fisheries Service (NMFS) surveys (1987-1996). Climatologies of the surface conditions (alongshore wind, sea surface temperature (SST), sea surface salinity (SSS)) revealed that the height of the upwelling season occurred during May and June. Variability in the surface conditions was high both inter-annually and inter-seasonally with maximum equatorward wind, lowest SST, and highest SSS during the months of May and June. Ten-year climatologies of hydrographic conditions from CTD data (depth and salinity on density anomaly surfaces, and temperature, salinity, density at discrete depths) indicated complex circulation patterns and water mass properties. The nearshore region contained relatively dense, upwelled water and isopycnal gradients conformed to local bathymetry. A robust upwelling filament off Pt. Reyes and three anticyclonic eddy-like features west of the shelf break appeared in the climatologies. Empirical orthogonal function (EOF) analysis of the subsurface variability confirmed the presence of the prominent features that appeared in the climatologies. The geophysical signals of the first three EOF-amplitude pairs represent a cross-shore mean upwelling pattern, an alongshore pattern caused by spatial variations in wind and gradients of water mass characteristics, and a filament-eddy resolving pattern, respectively.

KEYWORDS: Upwelling, Filaments, Eddies, Mesoscale Circulation, Empirical Orthogonal Functions

DoD KEY TECHNOLOGY AREA: Other (Coastal and Fisheries Oceanography)

OCEANOGRAPHY OBSERVED DIRECTIONAL SPECTRA OF SHOALING AND BREAKING WAVES

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The evolution of the frequency-directional wave spectrum, E(f, 0), across the inner continental shelf and beach was examined with measurements collected at the U.S. Army Corps of Engineer's Field Research Facility during the recent SandyDuck experiment. Arrays of bottom pressure sensors were deployed on the shelf in 20 m depth and on the beach in depths ranging from 2 - *5* m. These arrays were complemented by a directional wave buoy in 20 m depth and an array of pressure sensors in 8 m depth maintained by the U.S. Army Corps of Engineers. A preliminary analysis of these data is presented here focused on four case studies that illustrate the observed wave shoaling evolution in both non-breaking and breaking conditions. Estimates of E(f,0) extracted from array cross-spectra at six cross-shore locations are compared to predictions of linear refraction theory. The present observations support conclusions from previous studies that the cross-shore evolution of dominant wave propagation direction is well described by linear refraction theory. Observations of harmonic peak development at directions aligned with the dominant waves are consistent with theoretical wave-wave interaction rules and previous observations. In both non-breaking and breaking conditions, the observed E(f, 0) are directionally broader than predicted. In contrast to previous observations on a barred beach, the present observations on a planar beach do not show a dramatic broadening of directional wave spectra in the surf zone.

DoD KEY TECHNOLOGY AREA: Other (Environmental Prediction)

KEYWORDS: Ocean Surface Gravity Waves, Directional Wave Spectra, Surf Zone, Wave Shoaling, Beach

TRANSIENT LOCALIZATION IN SHALLOW WATER ENVIRONMENTS

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In this work, the robustness of a simple, Bartlett-type processor based on matching broadband signal autocorrelation functions is investigated. Measures of robustness to be examined include the size of the localization footprint on the ambiguity surface and the peak-to-sidelobe levels in the presence of environmental mismatch and noise. A full-wave PE model is used to produce broadband replicas. Both model-generated synthetic signals, which provide baseline results, and measured pulses in a shallow water environment are analyzed.

This work suggests that environmental mismatch has a more significant effect on the localization performance than noise. It also suggests that, as long as the noise level is not higher than the signal level, the localization performance will not be significantly affected. This is to be expected, since for white noise the majority of the influence on the autocorrelation function occurs at zero lag which has been removed in the localization algorithms. It is also shown that the autocorrelation matching in the time-domain is generally more useful for smaller bandwidths at low frequencies, which has been observed in previous work, whereas the autocorrelation matching in the frequency-domain is better suited for larger bandwidths and higher frequencies.

DoD KEY TECHNOLOGY AREA: Modeling and Simulation

KEYWORDS: Autocorrelation Matching, Transient Localization, Shallow Water

A WIND-FORCED MODELING STUDY OF THE CANARY CURRENT SYSTEM FROM 300 N TO 42.50 N

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A high-resolution, multi-level, primitive equation ocean model is used to investigate the roles of wind forcing and irregular coastline geometry in the generation of currents, eddies, jets and filaments in the Canary Current System (CCS) from 300 N to 42.50 N. To study the generation, evolution, and sustainment of the currents, eddies, jets and filaments in the CCS, the model is forced from rest using seasonal climatological winds and a realistic coastline. Results of the experiment show that wind forcing alone is capable of generating surface currents, undercurrents, meanders, eddies, and filaments. Preferred eddy generation locations, enhanced growth of meanders, eddies, and filaments are seen. The features produced by the model are consistent with available observations of the CCS.

DoD KEY TECHNOLOGY AREAS: Battlespace Environment, Environmental Quality, Modeling and Simulation

KEYWORDS: Primitive Equation Model, Canary Current System, Currents, Meanders, Eddies and Filaments

ANALYSIS OF EDDY RESOLVING MODEL OF THE CALIFORNIA CURRENT SYSTEM

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A high-resolution, multi-level, primitive equation ocean model is used to investigate the combined role of seasonal wind forcing, thermohaline gradients, and coastline irregularities on the formation of currents, meanders, eddies, and filaments in the California Current System from 22.5∞ N to 47.5∞ N. An investigation of the dynamical reasons for the generation and growth of meanders and eddies is conducted along with a sensitivity study to investigate the formation of the Davidson Current.

Model results are consistent with the generation of eddies from instabilities of the equatorward current and poleward undercurrent via barotropic and baroclinic instability processes. The meandering equatorward jet south of Cape Blanco is shown to be a continuous feature, which divides coastally-influenced water from water of offshore origin. The area off southern Baja is shown to be a highly dynamic environment for meanders, filaments, and eddies, while the area off Point Eugenia is shown to be a persistent cyclonic eddy generation region. Both the Southern California Countercurrent rounding Point Conception and the shoaling of the poleward undercurrent are shown to play important roles in generating the Davidson Current in the fall.

DoD KEY TECHNOLOGY AREA: Modeling and Simulation

KEYWORDS: Primitive Equation Model, California Current System, Currents, Meanders, Eddies, Filaments

COMPARISON OF ADVANCED ARCTIC OCEAN MODEL SEA ICE FIELDS TO SATELLITE DERIVED MEASUREMENTS

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Numerical models have proven integral to the study of climate dynamics. Sea ice models are critical to the improvement of general circulation models used to study the global climate. The object of this study is to evaluate a high-resolution ice-ocean coupled model by comparing it to derived measurements from Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) satellite observations. Utilized for this study was the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) Sea Ice Concentration Data Set from the National Snow and Ice Data Center. Using animations of side-by-side presentations, variability comparisons and anomaly values of the similarities and differences between the model and the satellite were noted. The model shows a true representation of the seasonal cycle of ice concentration variation, with natural growth, advection, decay. Model performance is weakest in the East Siberian and Laptev Seas where excessive ice is developed. A 30-day lag in the freezing and melting of ice in Hudson Bay was noted in the model. The use of monthly mean Levitus temperatures adversely affects model performance evidenced by a tendency to grow and retain excess ice in the marginal seas of the Arctic Ocean.

DoD KEY TECHNOLOGY AREAS: Modeling and Simulation, Space Vehicles

KEYWORDS: Numerical Models, Climate Dynamics, Sea Ice General Circulation Model, SMMR (Scanning Multichannel Microwave Radiometer), SSM/I (Special Sensor Microwave/Imager), Satellite, NASA National Aeronautics and Space Administration), Goddard Space Flight Center, National Snow and Ice Data Center, Ice Concentration, East Siberian and Laptev Seas, Hudson Bay, Arctic Ocean

VERTICAL AND HORIZONTAL LENGTH SCALES OF SUSPENDED SEDIMENT IN THE NEARSHORE

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Suspended sediment measurements acquired using acoustic and optical sensors are analyzed to determine the vertical and horizontal coherence length scales in the nearshore zone across a barred beach during the SandyDuck experiment.

Suspended sediments over the vertical, from the seafloor to approximately 65 cm above the bed, are inferred from acoustical backscatter of a 1.3 Mhz signal at discrete 1.7 cm bins. The height of the bedload layer ranged from 1.7 – 3.4 cm above the bed floor for all stations investigated, which is twice the height of the theoretical wave boundary layer. The vertical coherence length was found to be an order of magnitude greater than the wave boundary layer and had a weak dependence with wave height, depth of water and orbital excursion (linear correlation coefficient of 0.6 statistically significant at 95% confidence).

The cross-shore horizontal coherence length scale of suspended sediment was determined using a two meter lagged array of six optical backscatter sensors at an elevation of approximately 18 cm above the bed. The horizontal coherence length scale was approximately 0.8 times the rms wave orbital excursion length for all cross shore stations. Both the vertical and horizontal coherence length scales are longest for infragravity waves and decrease with increasing frequency.

DoD KEY TECHNOLOGY AREA: Other (Littoral)

KEYWORDS: Suspended Sediment Length Scales, Suspended Sediment, Nearshore

LOW FREQUENCY ACTIVE SONAR (GENERIC UK) PERFORMANCE ASSESSMENT IN THE OPERATIONALLY SIGNIFICANT AREA OF THE NORTHWEST APPROACHES TO THE UNITED KINGDOM

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The goal of this research was to make a performance assessment for a generic UK Low Frequency Active Sonar (LFAS) operating in the northwest approaches to the UK. Five diverse and operationally significant sound speed and geoacoustic transects of the region in winter and summer were considered. The intention was to use an operational, ray theory based, acoustic propagation loss model for the performance assessment at 400 Hz and 800 Hz for various source/target depths. Prior to the assessment the ray model was compared with a finite element primitive equation transmission loss model (RAM) to, firstly, validate the propagation loss algorithms, and, secondly, to make any required corrections to the ray model propagation loss output as a result of variable geoacoustic conditions. Results show that the ray model compares favorably with RAM and only minor corrections were required. RAM was also used to evaluate the effect of the South East Icelandic Front in summer on acoustic propagation at the frequencies of interest. Results demonstrate that, depending upon source/receiver dispositions, the inclusion of range dependent sound speed profiles and geoacoustic parameters are a necessity. LFAS performance results demonstrate that the system is able to achieve good results with lower frequencies performing better than high frequencies. However, high reverberation levels are a severe limiting factor. Investigation into advanced signal processing techniques suggest that the utilization of inverse beamforming techniques has the potential to improve detection opportunities by suppressing reverberation.

DoD KEY TECHNOLOGY AREAS: Battlespace Environments, Sensors, Modeling and Simulation

KEYWORDS: Oceanography, Propagation Loss, Low Frequency Active Sonar, Performance Assessment, Northeast Atlantic, Inverse Beamforming

AIR-SEA INTERACTIONS AND WATER MASS STRUCTURE OF THE EAST CHINA SEA AND YELLOW SEA

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The climatological water mass features, the seasonal variabilities of the thermohaline structure, and the linkage between fluxes (momentum, heat, and moisture) of the East China and Yellow Seas have been investigated. The long-term mean surface heat balance corresponds to a heat gain of 15 W m^{-2} in the Yellow Sea shelf (YS), a heat loss of around 30 W m^{-2} in the East China Sea shelf (ECS) and Cheju bifurcation zone (CB), and around 65 W m^{-2} in the Taiwan Warm Current region (TWC) and Kuroshio Current region (KC). The surface fresh water balance, i.e., evaporation minus precipitation, ranges from -1.8 to -4.0 cm/month for the five subareas. The four seasons for the study area are divided based on the relative heat storage, which do not follow the usual atmospheric seasons. The entire water column of the ECS, YS, and CB undergoes a seasonal thermal cycle with maximum values of temperature during summer and maximum mixed layer depths during winter. Only the surface waters of TWC and KC exhibit a seasonal thermal cycle. Two patterns exist in the surface salinity and Yangtze River run-off, out of phase in the East China Sea and in phase in the Yellow Sea.

DoD KEY TECHNOLOGY AREA: Other (Physical Oceanography)

KEYWORDS: Water Mass Features, Thermohaline Structure, Seasonal Cycle

THE SOUTH CHINA SEA THERMOHALINE STRUCTURE AND CIRCULATION

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The South China Sea (SCS), the largest marginal sea in the West Pacific Ocean, is separated from adjacent oceans by a chain of islands. The deepest water is confined to a bowel-type trench, and the maximum depth is approximately 5,000 m. Most of the existing studies on the seasonal and interannual variability have been based only on surface temperature data. However a primary need is an understanding of the three-dimensional thermohaline circulation. The minimum curvature with spline method was used to establish a three-dimensional monthly-varying gridded data from the Navy's Master Oceanographic Observation Data Set (approximate 189,000 profiles), covering the area of 5°N - 25°N and 105°E - 125°E and from the surface to 400 m depth. For temperature, profiles were binned into 204 monthly data sets from 1968 to 1984 (17 years). Because of the paucity of salinity data, salinity profiles were binned into 12 climatological monthly data sets, and the monthly climatological mean was computed. After the gridded data set had been established, both composite analysis and the Empirical Orthogonal Function (EOF) analysis were used to identify the major thermohaline features. The first EOF mode accounts for 26.7% of the variance and represents the seasonal variation. The second EOF mode accounts for 17.7% of the variance and represents the interannual SCS warming/cooling phases. Furthermore, the P-vector method was used to invert three-dimensional velocity fields from the analyzed temperature and salinity

data. Important dynamical processes, including the Kuroshio intrusion, the western boundary current (counter-current), the cross basin current (under counter-current), the mesoscale eddies, and the basin gyre are identified.

DoD KEY TECHNOLOGY AREA: Other (Physical Oceanography)

KEYWORDS: Water Mass, Thermohaline Structure, Seasonal Variation, Circulation

ESTIMATING THE ACOUSTIC MODAL ARRIVALS USING SIGNALS TRANSMITTED FROM TWO SOUND SOURCES TO A VERTICAL LINE HYDROPHONE ARRAY IN THE 1996 SHELFBREAK PRIMER EXPERIMENT

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During the 1996 multi-institutional Shelfbreak PRIMER experiment, low frequency sound sources were moored on the continental slope south of Cape Cod. These sources transmitted phase encoded tomography signals which were monitored by vertical-line hydrophone arrays moored on the continental shelf. The measured signals were processed for the acoustic modal arrivals and their variability in time. The processing entailed pulse compression, coherent averaging, local sound-speed profile updates and an application of the Chiu-Miller-Lynch model-based modal beamforming technique. In this thesis, the signal processing procedure is discussed and the modal arrival estimates are examined. The model-based estimates are found to be of high quality, with all propagating modes individually resolved. This unambiguous separation of the high modes cannot be achieved using simple least-squares techniques because of under sampling. The temporal variability of the modal amplitudes and travel times are found to be related to ocean processes that are unique to the shelf-slope littoral environment.

DoD KEY TECHNOLOGY AREAS: Battlespace Environments, Sensors

KEYWORDS: Acoustics, Array, Mode, Processing

STRUCTURE AND VARIABILITY OF THE MESOSCALE CIRCULATION IN THE CARIBBEAN SEA AS DEDUCED FROM SATELLITE ALTIMETRY

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Four years of Topex/Poseidon (TIP) and European Remote Sensing Satellite (ERS) altimetry data in the Caribbean Sea are used to describe the structure and variability of the mesoscale circulation in this area. These results are compared with satellite-derived sea surface temperature (SST) and drifter trajectories for the same period of time. Contour maps of sea surface height anomalies made for each 10-day period (TIP data) reveal the formation and evolution of anticyclonic and cyclonic mesoscale features in the central part of the Caribbean Sea during the entire period studied. These features move westward at average speeds between 10 and 15 cmls, growing in amplitude up to 25 cm. Also, a quasi-permanent gyre is detected in the Golfo de los Mosquitos (coast of Panama and Colombia). The sense of rotation of this gyre is shown to be modulated seasonally. Enhanced relative clockwise and counterclockwise rotation are observed during the rainy season (June-October) and the dry/windy season (January-April), respectively. No strong mesoscale anomalies are detected in the eastern part of the Caribbean Sea where they are expected. A seasonal cycle is found in the sea level anomaly (SLA) derived from TIP and ERS-1 data due to steric effects. Upwelling is observed near the coast of Venezuela during the dry season. A

comparison of SLA with SST is made and good correlation is observed at some locations. Drifter trajectories contemporaneous with SLA data agree well with the sense of rotation of strong features, but the drifter speeds are twice the absolute geostrophic currents calculated from SLA.

DoD KEY TECHNOLOGY AREAS: Environmental Quality, Sensors

KEYWORDS: Caribbean Sea, Topex/Poseidon (TIP), ERS-l, Mesoscale Variability, Eddies, Sea Level Anomal (SLA), Satellite Altimetry

A P-VECTOR APPROACH TO ABSOLUTE GEOSTROPHIC CURRENTS IN THE ADRIATIC SEA

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With the recent conflict in Bosnia-Herzegovina being in the world news front, the Adriatic Sea has become an important strategic operating area for the North Atlantic Treaty Organization (NATO) and for the U.S. Navy. The NATO Undersea Research Centre located in La Spezia, Italy, carried out the Otranto Gap (OGAP) project in 1994 and 1995 to assess the oceanography and bottom geology of the Southern Adriatic. As part of this project, the OGEX1 cruise was conducted between 19 and 24 May 1995 with focus in the Otranto Strait, through which the Adriatic is connected to the rest of the Mediterranean basin and on the Albanian shelf. In this thesis the water masses present in the southern Adriatic are studied and the P-vector method is used to estimate the absolute geostrophic circulation, based on the hydrographic data (CTD, XCTD, and XBT) collected during the OGEX1 cruise. The P-vector results are interpreted and compared with other oceanographic data sets acquired during the OGAP project, namely current meter and ADCP data, drifter tracks, and thermal satellite images. The absolute geostrophic velocity at 40 m, derived by the P-vector method, shows rather well the expected cyclonic circulation in the Southern Adriatic north of 41^{o}N. In contrast, the results in the Otranto Strait area need to be interpreted with caution. Current meter data show that this area is very ageostrophic. A comparison between geostrophic and directly measured vertical velocity shears indicates a large departure from geostrophy in this area. The wind is shown to be a main factor forcing the circulation in the Adriatic, either directly or through changes in sea level.

DoD KEY TECHNOLOGY AREA: Battlespace Environments

KEYWORDS: Adriatric Sea, P-Vector Method, OGEX1, Current Meters, Drifters, Floats, ADCP

SPECTRAL ENERGY BALANCE OF WAVES IN THE SURF ZONE

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The spectral energy balance of waves in the surf zone is examined with extensive measurements from the Duck94 experiment. Cross-shore energy flux gradients are estimated from spectra observed with closely spaced pressure sensors. Nonlinear energy exchanges between different wave components in the spectrum are estimated from observed bispectra based on Boussinesq theory for near-resonant triad interactions. Dissipation of wave energy in the poorly understood breaking process is inferred as the residual term in the spectral energy balance.

Analysis of the spectral energy balance shows that large decreases in energy flux observed at the dominant wave frequencies as waves break over a sand bar are closely balanced by nonlinear energy transfers to higher frequencies. That is, the decay of the spectral peak within the surf zone is a result of nonlinear energy transfers rather than direct dissipation. At

higher frequencies, observed energy flux gradients are small and do not balance the nonlinear transfers of energy to high frequency components of the spectrum. This analysis suggests that the spectrum is saturated at high frequencies, and thus, the energy that cascades through nonlinear interactions to higher frequencies is dissipated in the high-frequency tail of the spectrum.

DoD KEY TECHNOLOGY AREA: Other (Physical Oceanography)

KEYWORDS: Dissipation, Energy Balance, Boussinesq Equations, Ocean Surface Gravity Waves, Nonlinear Interactions, Shoaling, Beach, Energy Flux

MODEL ANALYSIS OF ENERGY SPREADING LOSS OFF THE CAROLINA COAST FOR TACTICAL ACTIVE SONARS

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Energy spreading loss (ESL) is the reduction of the transmitted pulse energy level by spreading of the pulse in time due to multipath propagation. This energy spreading will reduce the effectiveness of mid-frequency tactical sonars. The U.S. Navy training areas of Long Bay and Onslow Bay off the Carolina Coast were chosen for the study of ESL to provide contrasts in many of the geoacoustic properties that can change ESL. Inputs were varied by source depth, receiver depth, sound speed profile (SSP), bathymetry, and geoacoustic properties. The computer model FEPE_SYN calculated the ocean transfer function (OTF) for the modeled environment in the frequency domain. The time domain output pulse was calculated using the OTF, an input pulse, and an inverse discrete Fourier transform. Using the same energy as the output pulse, a compressed pulse was created with the same shape as the input pulse. ESL was determined by comparing the peak level of the output pulse to the peak level of the compressed pulse. A mismatch loss (MML) was calculated by comparing the maximum values from the correlation of the input pulse with the output pulse and compressed pulse.

The ESL of the output pulse was dependent on several factors. Absorptive (silt/clay) sediment sea beds had average ESL values 3 dB less than that of compacted sand. The compacted sand bottom was also compared to an even more reflective sediment, a limestone sediment layer. ESL values were higher by an additional 3 dB for the limestone bottom. Minimum ESL levels were found when the source and target were at the same depth. Changing source and target depths (e.g., cross layer) could increase ESL levels up to 8 dB from the minimum ESL level. The impact of using a range-dependent SSP vice constant SSP was inconclusive in that ESL values could be larger or smaller by 3 dB compared to range-independent runs. Similar inconclusive results were obtained when actual bottom depths were employed vice a flat-bottom run. As found by Tanaka (1996), ESL was observed to rapidly increase in the first 1000 m and thereafter fluctuate around a mean value. This initial critical range is evidently site dependent but appears to be confined between 300 to 1000 m range.

DoD KEY TECHNOLOGY AREA: Battlespace Environments, Sensors

KEYWORDS: Acoustics, Energy Spreading Loss, ESL, Underwater System, FEPE, FEPE_SYN, Active Sonar, Hamilton Geoacoustic Model, Transmission Loss, Mismatch Loss, MML, Time Domain Analysis

IDENTIFICATION OF ACOUSTICALLY ACTIVE ARCTIC PRESSURE RIDGES THROUGH THE USE OF RADARSAT GEOPHYSICAL PROCESSOR SYSTEM (RGPS) SEA ICE PRODUCTS

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The identification of acoustically active pressure ridges in the Arctic Ocean represents an important step in the development of a physics-based, operational Polar ambient noise model. One method to accomplish this goal is through the use of satellite-based remote sensors, specifically synthetic aperture radar (SAR).

A proof-of-concept study was conducted that determined that the RADARSAT Geophysical Processor System (RGPS), currently being developed at NASA JPL, Pasadena, CA, produces SAR-derived sea ice products capable of quantifying large-scale ice deformation that may produce significant levels of low frequency ambient noise.This research also identifies the meteorological forcing that causes the sequence of divergent and convergent events in the ice cover, which results in the creation of open water leads and subsequent generation of noisy pressure ridges. Offshore followed by onshore winds near coasts and land-fast ice and atmospheric lows/troughs followed by atmospheric highs/ridges or velocity shear in straight isobaric flow result in significant pressure ridge formation.

The RGPS ridging algorithm shows that more ridges exist in RGPS cells exhibiting large cell area changes than in those with small area changes, assuming relatively constant sail heights in all cells.

The feasibility of using ice divergence fields generated by Fleet Numerical Meteorology and Oceanography Center's (FNMOC's) Polar Ice Prediction System (PIPS) was evaluated. NIPS modeled ice divergence patterns reasonably well, although divergence values in the high Arctic ice cover were underestimated.

DoD KEY TECHNOLOGY AREA: Other (Remote Sensing, Arctic Ocean)

KEYWORDS: Polar Oceanography, Pressure Ridges, Open Water Leads, Ice Deformation, Synthetic Aperture Radar, RADARSAT, Geophysical Processor System, Polar Ice Prediction System, Low Frequency Ambient Noise, Arctic Submarine Operations, Remote Sensing

THE ROLE OF SALINITY IN EQUATORIAL MIXED LAYERS

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The purpose of this study was to understand the role of surface salinity flux in changing heat exchange between the ocean and the atmosphere by means of its effect on mixed layer dynamics. This was accomplished by a series of thirty-day mixed layer experiments using the one-dimensional Naval Postgraduate School (NPS) mixed layer model. Results from the NIPS mixed layer model, forced with both idealized and in situ data from the western equatorial Pacific Ocean, demonstrated that salinity can play a significant role in potentially changing the surface heat flux, with its effect on the mixed layer depth and mixed layer temperature. Precipitation stabilized the mixed layer by creating a barrier layer, which slowed entrainment. The net accumulation of rain was found to be an important source of buoyancy that reduces entrainment by subsequent wind mixing events.

DoD KEY TECHNOLOGY AREA: Battlespace Environments

KEYWORDS: Oceanic Mixed Layer, Salinity, Ocean Models